CHASSIS Lubricate for SAFETY every 1,000 MILES LUBRICATION

The Institute Spokesman

Published by
NATIONAL LUBRICATING GREASE INSTITUTE

VOLUME VI • NUMBER 10 JANUARY, 1943

This is your Industry —be proud of it!

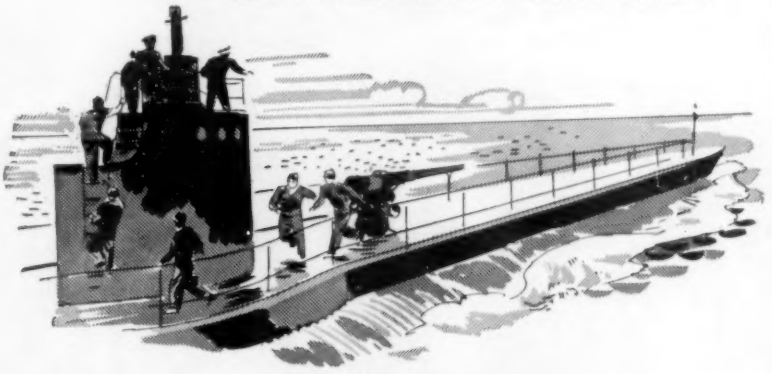
Sure, everyone knows that petroleum products are vital to the conduct of the war. The planes and tanks, the jeeps and trucks must have gasoline and lubricants. The battleships and carriers, the submarines and transports and destroyers have to have fuel oil. All of these needs are being taken care of.

But there are many other ways in which our industry is privileged to help. Some of them are unusual, even amazing, as you will likely agree when you read about them on this and the four following pages. All of them are the result of the oil industry's reliance on research to produce better products for an industrial civilization.

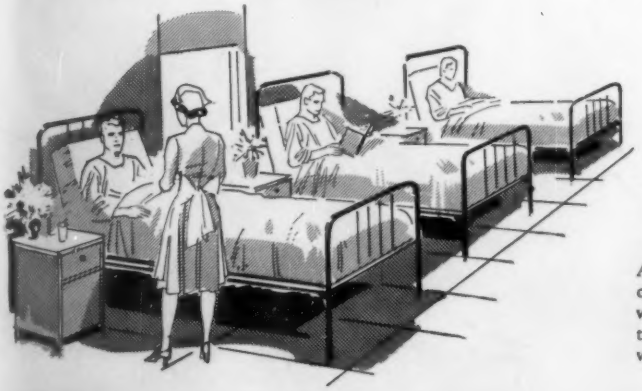
While many important uses of petroleum have been developed as strictly war products, it may be said—and to our national credit—that most of the advances and developments achieved by our industry's chemists and engineers were inspired by motives which were constructive—not destructive. It may well be poetic justice that the fruits of their skill and labor, intended for peacetime uses, have these wartime applications.

Reprinted, courtesy, THE ORANGE DISC, *published by* GULF OIL CORPORATION—GULF REFINING COMPANY

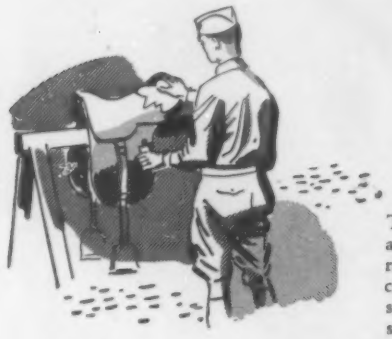
SYNTHETIC RUBBER FOR A THOUSAND USES—An extract from petroleum called butadiene is helping to make up for the stoppage of our natural rubber supply. Tires for trucks and jeeps, treads for tanks, bullet-proof linings for plane gas tanks, are among the things being made from this material.



ANTI-SLICK GREASE FOR SUBMARINES—The bearings and surfaces of submarine fins require lubrication but no ordinary lubricant will do because it leaves oil spots on the water which are a dead give-away to the enemy. As a solution, petroleum technologists developed a U-boat grease that sinks instead of rising to the water's surface and thus leaves no tell-tale oil slick for our enemies to follow.

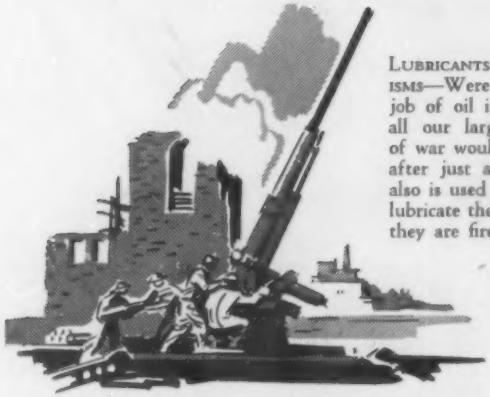


AID FOR THE SICK AND WOUNDED—Salves and light mineral oils of many types help speed the recovery of our sick and wounded. These, together with ingredients of soaps and toilet preparations, are contributions of the oil companies toward a healthier, cleaner Army.

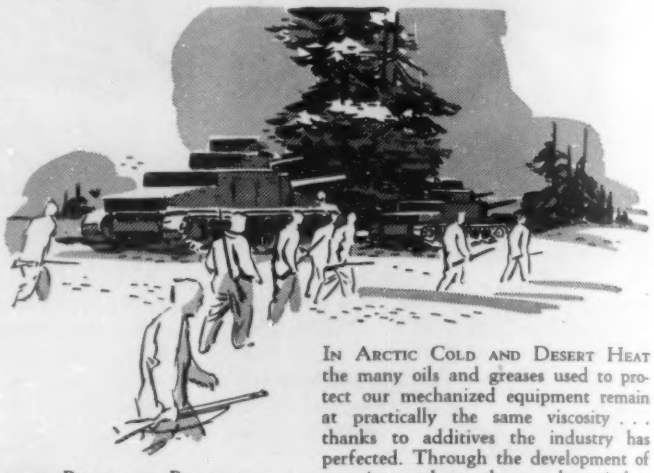


BETTER WOOLENS FOR THE ARMED FORCES—Practically unknown to the average person is a special wool treating oil developed by the petroleum industry. Used in the manufacture of clothing and blankets, these oils lubricate the fibers during the yarn spinning process and provide the American soldier with the finest uniform in the world.

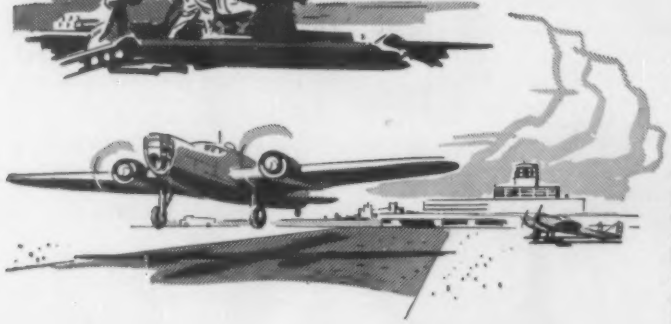
THE LIFE OF LEATHER EQUIPMENT—such as boots, saddles, and harnesses would be shortened materially were it not for regular applications of petroleum base products made especially for this purpose. In addition to keeping the leather soft and pliable, the application of leather treating and preserving oils serves the dual purpose of waterproofing.



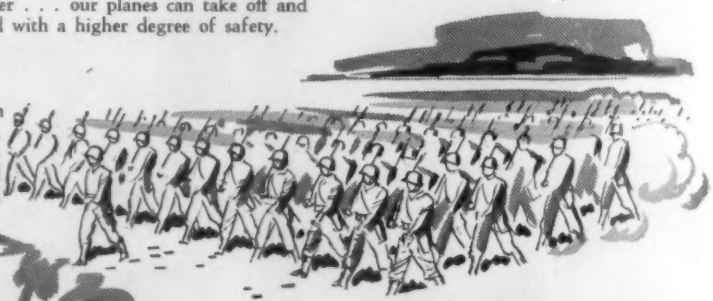
LUBRICANTS FOR GUN RECOIL MECHANISMS—Were it not for the protective job of oil in the recoil mechanisms of all our large guns, these instruments of war would be rendered unfit for use after just a few shots were fired. Oil also is used to protect the shells and to lubricate the gun muzzle through which they are fired.



IN ARCTIC COLD AND DESERT HEAT the many oils and greases used to protect our mechanized equipment remain at practically the same viscosity . . . thanks to additives the industry has perfected. Through the development of superior products, the petroleum industry is doing its part to bring victory to the Allies and peace to the world.



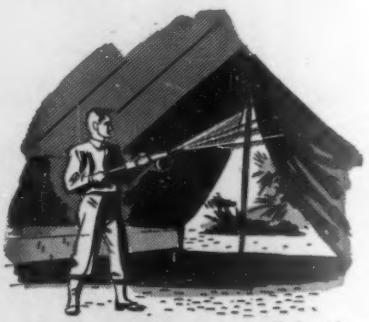
ASPHALT FOR ROADS AND RUNWAYS—Great quantities of this material—a petroleum residue—are used for the construction of roads for mechanized equipment and for runways for our bomber and fighter planes. Result—our troops and equipment can travel faster . . . our planes can take off and land with a higher degree of safety.



NO LONGER DO SOLDIERS DRILL on fields covered with dense clouds of dust. For dust-laying oils, developed for peacetime use on playgrounds, are being used on parade grounds to provide a cleaner, healthier place for training.

OIL KEEPS HIM ON THE FIRING LINE—Yes, oil plays a part even in the life of an infantryman. To keep his rifle firing, light lubricants with extraordinary properties that reduce gumming to an almost unknown degree have been developed and correct methods of application have been devised.

EXPOSED TO THE ELEMENTS, guns and gun parts soon would become oxidized and rendered useless were it not for the protective coatings of rust preventives supplied to our armed forces by the petroleum industry. In addition to the guns themselves, every shell and instrument is thus protected from the attacks of oxygen—the invisible enemy that hides in the air.



IN TIME OF WAR uncontrolled epidemics would take more lives than enemy bullets. In order to prevent disease, insecticides originally developed by the petroleum industry for use in the home are being employed by our armed forces to kill germ-carrying flies, mosquitoes, and other insects.

The INSTITUTE SPOKESMAN

Published monthly by

THE NATIONAL LUBRICATING GREASE INSTITUTE

GEORGE W. MILLER ..... *Editor*

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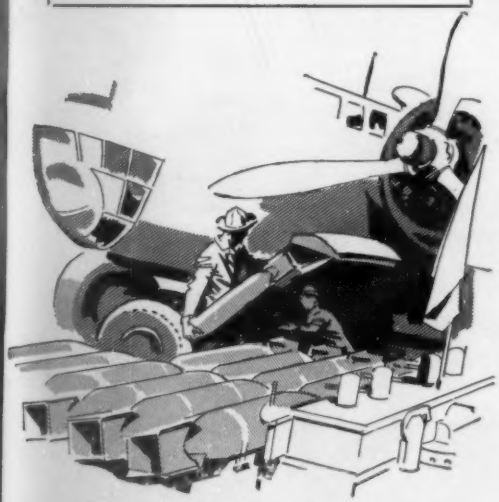
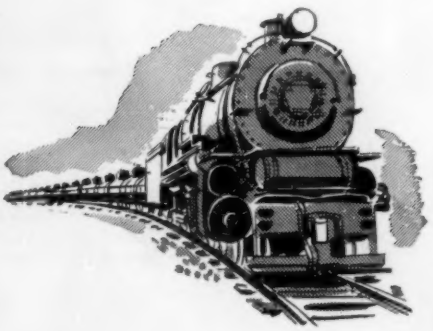
Several changes have been made in U. S. Army Specifications 2-106 to 2-110. Copies of these revisions can be obtained from the Office of Chief of Ordnance, War Department, Washington.



EXPLOSIVES—During the last war, most of the toluene used to make TNT was a by-product from the coking of coal. As a result of patient research, pure toluene now is being turned out of the petroleum refineries in great quantities. Other petroleum industry produced explosives that can be manufactured in vast quantities are tri-nitroglycerin and picric acid.

FLYING AT 30,000 FEET the life of an air pilot and the success of his mission depends upon the accuracy of his instruments. Minute though they are in quantity, the instrument oils required for this purpose must be high in quality—must be capable of supplying proper lubrication regardless of temperature encountered.

MAXIMUM PRODUCTION is the aim of every manufacturer—especially when a nation is at war. To help achieve this goal in the metal working industries, cutting oils with special properties are employed to speed up the machining operations and to keep the metal and the tools from becoming excessively hot.



EVERY TRAIN, EVERY CAR, EVERY SWITCH of our country's railroads is being worked to capacity so that war materials and munitions can be whisked to the fighting fronts. Without an endless supply of such petroleum products as Diesel fuels, lubricating oils and greases, transformer oils, and switch oils, it would be impossible for the railroads to continue the magnificent job they are doing in moving men and material.

WOOL GREASES

(Degras)

Common — Neutral — Lanolin

For All Purposes

Refined by

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BROOKLYN, N. Y.

"Business is Ingreasing"

BATTENFELD GREASE & OIL CORP.

KANSAS CITY, MO.

MINNEAPOLIS, MINN.

N. TONAWANDA (Buffalo) N. Y.

•

Manufacturers of

BAT'S GREASES

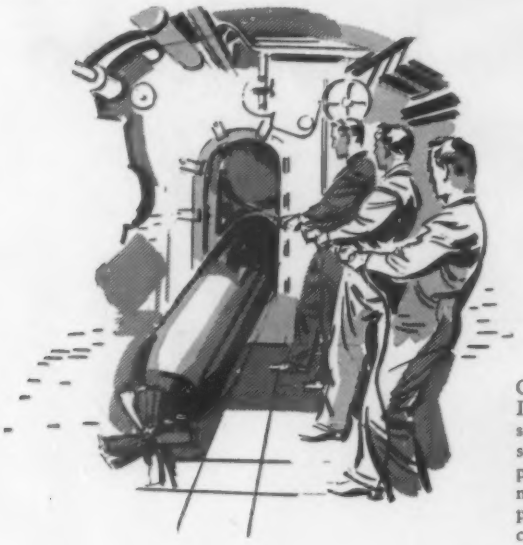
exclusively for Refiners and the Jobbing Trade

SHIPPING CONTAINERS FOR ALL LUBRICANTS

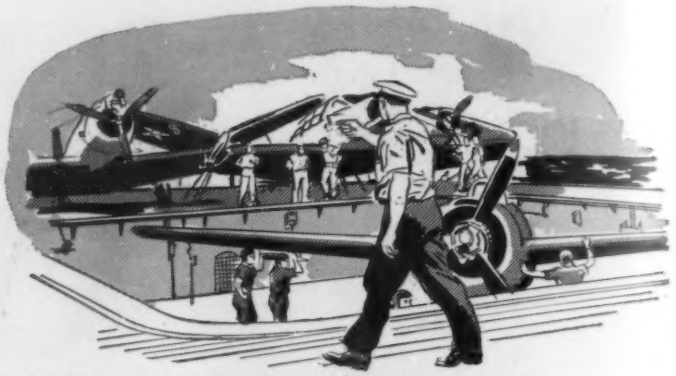
•

The Draper Manufacturing Co.

Cleveland, Ohio

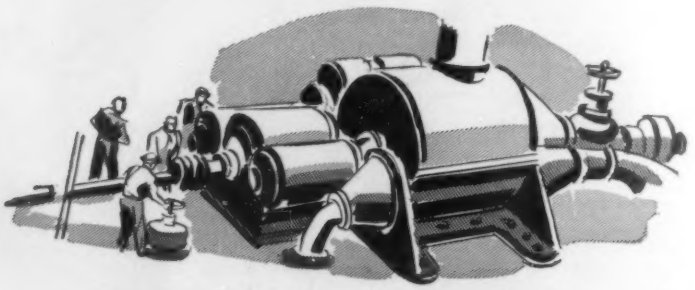


OIL MAKES 'EM GO AS DIRECTED—Inside every torpedo fired at Axis vessels is an ingenious device called a gyroscope which keeps the projectile on its predetermined course. Protecting the mechanism of each of these intricate pieces of mechanism is a special lubricant designed to do a specific job.

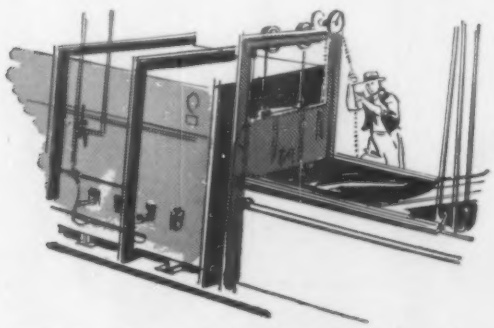


ONE RARELY THINKS OF WIRE ROPE as a material requiring much care, yet without proper lubrication it would be rendered unfit for use in a very short time. To lengthen the life of wire rope in its many applications, the oil industry has developed proper greases which today are helping our armed forces on the war front and our production plants on the home front.

IN THE CAVALRY and on the farms at home, too, veterinary medicines and supplies containing light oils and petrolatums are indispensable. In addition, livestock sprays from the petroleum refinery help to keep animals contented and better fitted for their jobs.

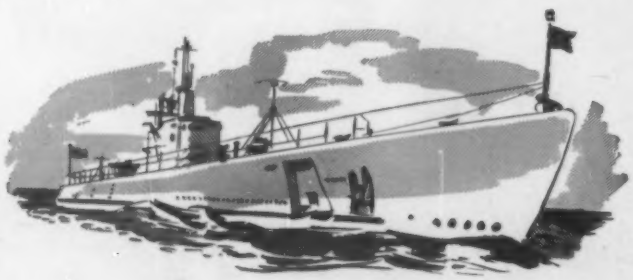


BENEATH THE DECKS of every large ship are the turbines upon which the vessel depends for its speed and maneuverability. Safeguarding these are various turbine oils containing such petroleum additives as butylated para cresol, naphthenic acid salts, and sulphurized cracked hydrocarbons.



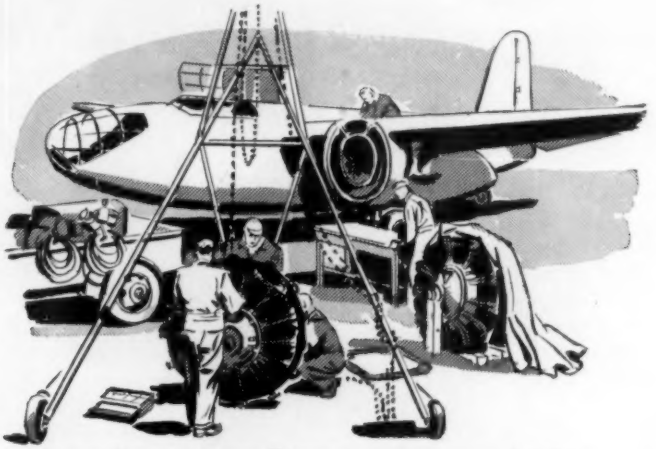
FAR BEHIND THE LINES production workers in our iron and steel plants produce the metal so frequently referred to as "the backbone of our war effort." Aiding in this effort are numerous oil products including miscellaneous oils and greases, coal spray oils, wire rope lubricants, quenching oils and rust preventives.

IN ORDER TO KEEP OUT the wind and the rain, tar impregnated building and roofing papers are used extensively in the construction of Army barracks and defense homes. In addition, great quantities of waterproofing materials which are by-products of oil refining are consumed yearly by the Navy.

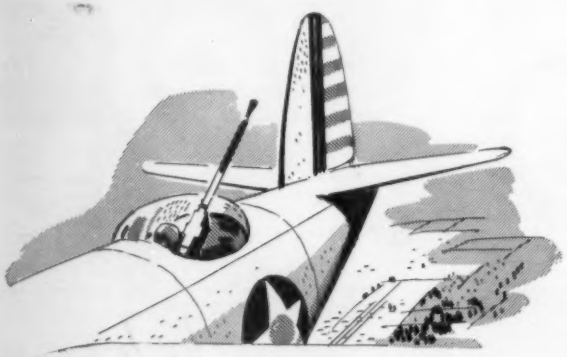


UNDER THE COVER OF DARKNESS the submarine comes to the surface, and with the power of its Diesel-powered engines recharges its batteries so that it might travel beneath the surface, come the morrow. Diesel fuels also are used to supply the motive power of PC boats and similar small craft.

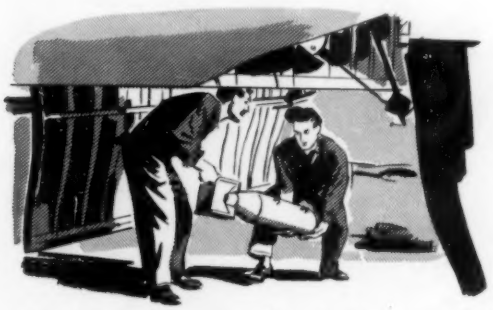
BECAUSE OF MODERN REFRIGERATING METHODS foods can be kept at neighborhood food store freshness no matter how far our armed forces may be away from home. Refrigerator machine oils with low pour points are used extensively for the compressors for virtually all refrigerating and ice making equipment—from the small home unit to the giant industrial and Army installations.



IN THE FIELD AS IN THE FACTORY numerous new and replacement parts of all mechanized equipment must be 'ground in' with exacting care. Aiding in this all-important work are various light lubricating oils which act as carriers for the various abrasives used.



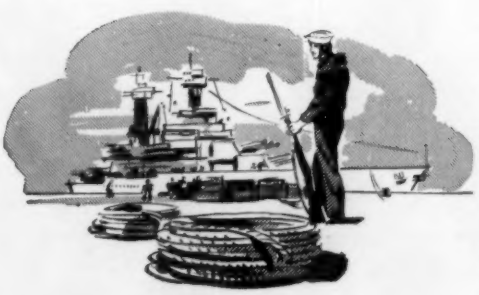
PLASTICS FOR PLANES—Those glass parts you see in our modern bombing planes aren't glass at all. They're plastics! Shatterproof, crystal clear, and light in weight, they're manufactured from chemical intermediates that come from America's petroleum refineries.



WERE IT NOT FOR HYDRAULIC OILS the big guns defending our coast lines would lose much of their effectiveness for this product of the petroleum marketers supplies the force exerted to raise and lower these weapons. These same oils also play a prominent role in aerial offensive for they are used for the operation of bomb release bays and retractible landing gears.

AN ARMY TRAVELS ON ITS STOMACH—This adage has been proven time and again. On the home front, food manufacturers turn to the petroleum industry for their vast requirements of paraffine waxes. In addition, great quantities of lubricants, food conditioning oils, and insecticides are used in America's food processing plants.

THE TRAMPING OF MARCHING FEET is not so frequently heard in this war as in World War I. Despite this, however, athlete's foot is one of the most common complaints of men in the service. To aid in the cure and prevention of this infection, a remarkably effective medicinal preparation has come from the oil refinery.



PERHAPS OF GREATER IMPORTANCE today than ever before in the history of this country is the cordage manufacturing industry which turns out all of our rope and rope products. For its operation, this mighty producer looks to the oil industry for its vast requirements of lubricating oils and greases, fiber conditioning oils, jute treating oils, cordage oils, and wash oils.

Flow Characteristics of Lubricating Greases

By A. BEERBOWER, L. W. SPROULE, J. B. PATBERG AND J. C. ZIMMER

(Continued from December Issue)

The flow characteristics of the greases determined in a capillary viscosimeter are compared in Figure 16 by plotting the rate of shear against the shearing stress. The curves become practically linear at rates of shear above 300, and if the slopes of these curves, or the mobilities of the greases, are plotted against the consumption characteristics of the greases determined in the laboratory shackle test, a straight line can be drawn through the points. This relationship is shown in Figure 17, where the slope or mobility values were taken at rate of shear of 530 sec.$^{-1}$. It may be added that, since the curves are linear in this region, any rate of shear above, say 300 sec.$^{-1}$, would give the same sort of agreement. Any small error in the slope determination corresponds to a very much smaller error in predicting consumption on the curve shown in Figure 17.

Still another application of lubricating greases where apparent viscosities over a range of rates of shear, or mobility data are of particular significance is on ship launching greases or the so-called slip coats which are applied over a hard, waxy, base coat on the launching ways. Comparisons of estimated yield values and slope of the curves on rates of shear, shearing stress graphs, such as illustrated in Figure 18 give an indication of the relative tendencies of the greases to squeeze out from between the launching ways under heavy loads. The mobility or slope of the curve at higher rates of shear gives a relative comparison of the resistance to flow or the friction due to the grease during the actual launching of the ship.

TABLE IV

Range of 15° Revolution Starting Torques in Gm. Cm. at −40°F on Conrad 204 Bearings Determined by Four Laboratories

Lubricant	Bearing Filled Nut Spun	Bearing Filled Spun at 1800 RPM Prior to Cooling
K	4920/6350	220/738
L	500/615	123/250
M	300/269	70/246
N	1270/1476	200/492

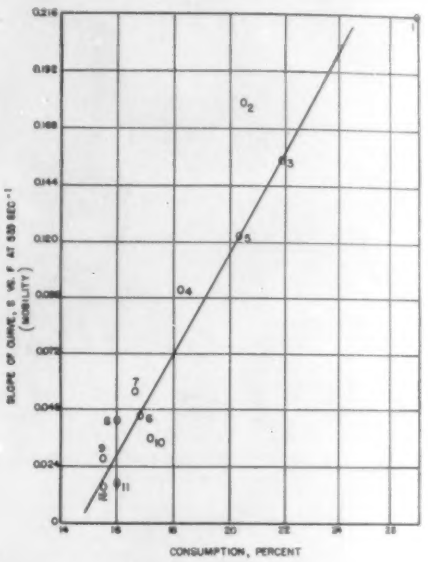
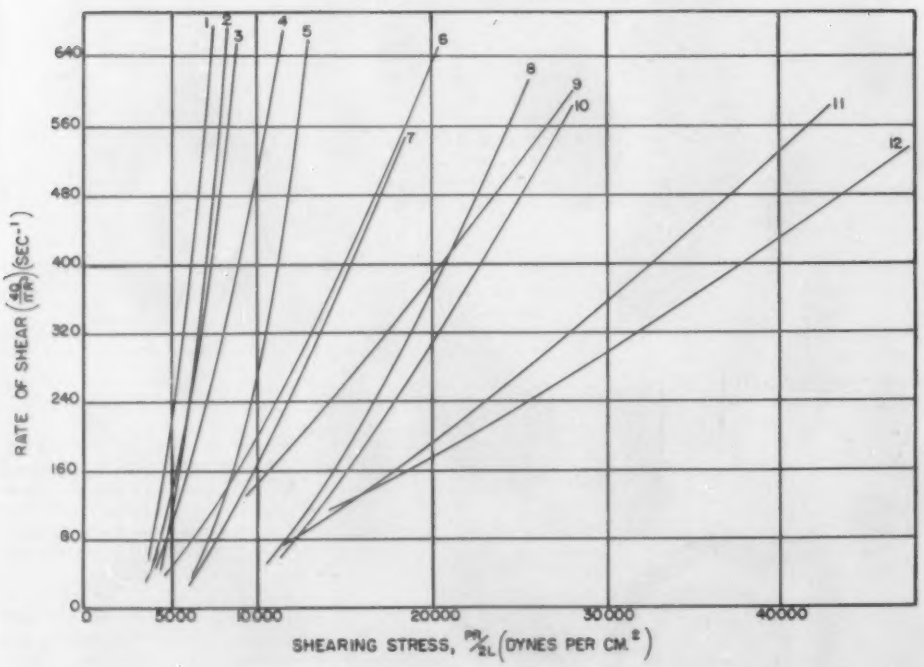


FIGURE 17

FIG.-16

FLOW CURVES FOR CHASSIS LUBRICANTS AT 81°F.



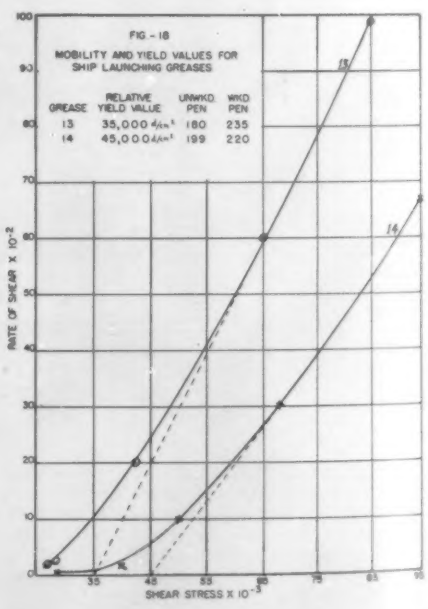


FIG.-18
MOBILITY AND YIELD VALUES FOR SHIP LAUNCHING GREASES
GREASE | RELATIVE YIELD VALUE | UNWKD. PEN | WKD PEN
13 | 35,000 dyn/cm² | 180 | 235
14 | 45,000 dyn/cm² | 199 | 220
RATE OF SHEAR X 10⁻²
SHEAR STRESS X 10⁻³

Further, apparent viscosity measurements at low temperatures on greases should be of value in the development and the control testing of products for use at sub-zero temperatures in anti-friction bearings, etc., where only very low torques are available to actuate the mechanisms. All of the common and certain special types of greases have been suggested for such service and several different anti-friction bearing test machines have been used to compare their low temperature starting, and running torque requirements (13, 14). It appears that such torque tests at sub-zero temperatures are not reproducible unless extreme precautions are taken to charge the bearings with the same quantity of grease, or, to spin them before test by a standard procedure to reproduce the distribution of the grease throughout the bearing. Further, variation in the cooling rate and interval at which the bearings are held at the test temperature may affect the results, and channeling of the grease or skidding of the balls on the bearing race can be the source of large errors.

Attempts to check starting torque requirements between different laboratories have not been very satisfactory as is indicated in Table IV on a series of tests on four types of low temperature greases.

Measurements of the time required for the first complete revolution of a bearing under a definite load appear more reliable, although the question always rises of what load should be used and will it necessarily correlate with service considering possible variation in the torque available in the mechanism.

Consequently, determinations are frequently made with a range of applied loads to give a range of RPM or intervals for one revolution. It has been suggested by Wright (15) that the results of such tests can be conveniently expressed as a "Plasticity Number" which is the product of the gram centimeters torque required for one revolution multiplied by the seconds time in which the revolution occurs. Wright has also demonstrated that the plot of Plasticity Number versus Temperature on a semi-log chart, such as the ASTM Viscosity-Temperature Chart yields a straight line as indicated in Figure 19.

(To be continued)

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Lubricating Oils — Greases

Foundry Core Oils

ALL GRADES OF GRAPHITE
FOR THE GREASE & OIL COMPOUNDER

EXCELLENCE D SINCE 1827

JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY, N. J.

2661

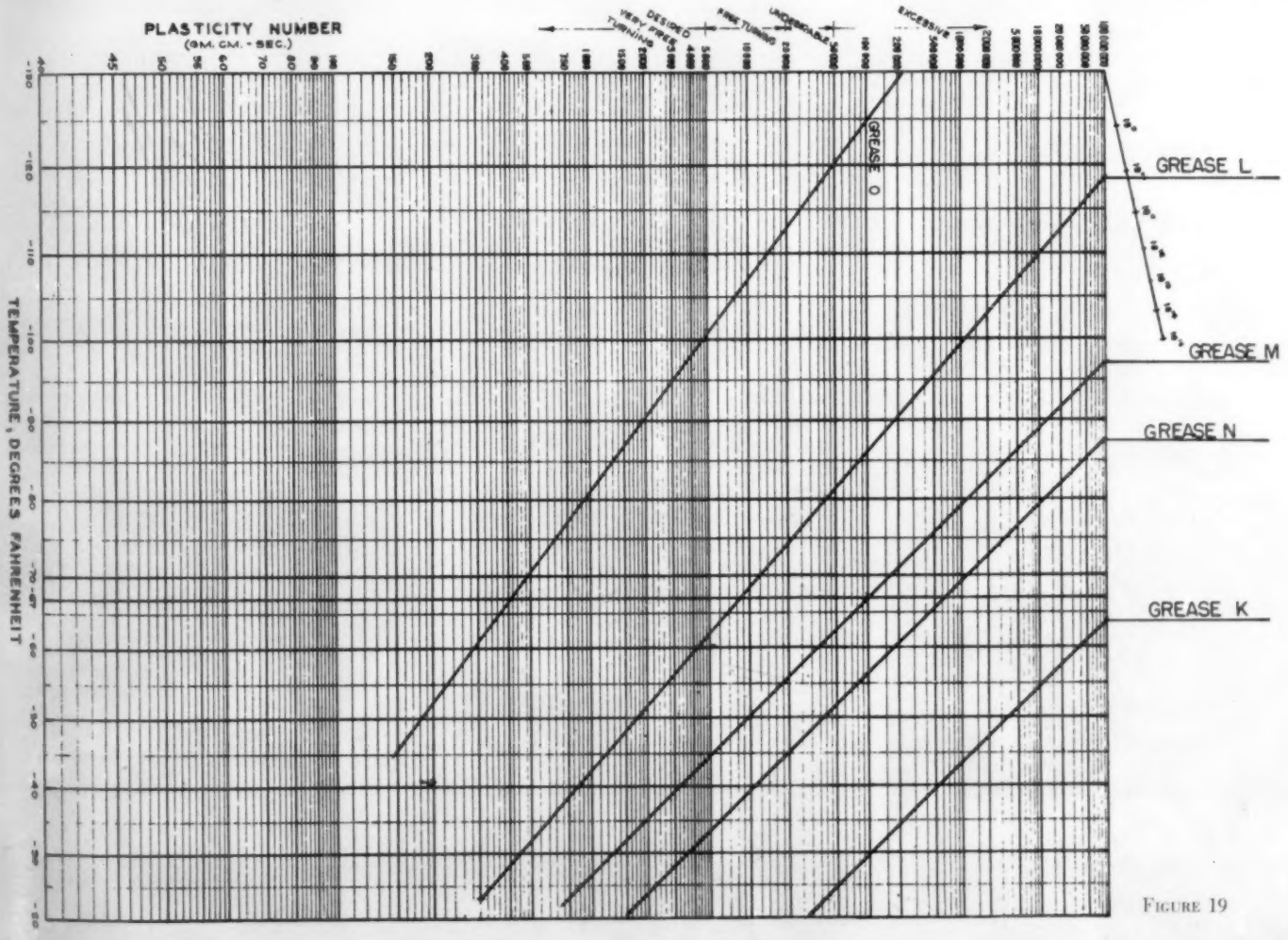
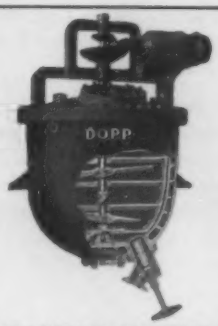


FIGURE 19

AUTOMOTIVE
AND LUBRICATING
GREASE SPECIALTIES
CUTTING FLUIDS
AND CORE OILS
PENOLA INC.
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.


DOPP
positively-scraped
GREASE KETTLES
and
PRESSURE MIXERS
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"G" Cylinder Stock
Dewaxed Bright Stocks
and Neutral Oils
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TRABON
Lubricating Equipment
•
Trabon Engineering Corporation
Cleveland, Ohio

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Kerosene Cans...and Lubricating Oil Containers...from one dependable source.
OWENS-ILLINOIS CAN CO.
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STEEL DRUMS and PAILS
Laboratory tested—Modern design for utility and strength—Label lithographed on the metal in colors—A real sales-builder for your product.
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Specialized Glycerides
and
FATTY ACIDS
for
Lubricating Greases
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Fats & Fatty Acids
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